Cross-linking and modifcation of sodium alginate biopolymer for dye removal in aqueous solution

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Abstract In this study, spherical beads have been prepared by ionotropic gelation of sodium alginate using two types of cross-linking, physical cross-linking in the presence of Ca2+ ions and chemical cross-linking which was made with epichlorohydrin for environmental applications. The diferent beads of alginate were characterized by Fourier transform infrared spectroscopy, optical microscopy, scanning electron microscopy, and X-ray difractometry to provide evidence of successful cross-linking. The physicochemical properties of the beads such as the average diameter, water content, the zero charge point, and the density were also determined. The efciency of the beads as biosorbent for the removal of dyes is assessed using methyl violet (MV) as a model molecule. A comparative adsorption performance of wet calcium alginate beads (WCaAB), dry calcium alginate beads (DCaAB), wet epichlorohydrin cross-linked alginate beads (WEpAB), and dry epichlorohydrin cross-linked alginate beads (DEpAB) was made. The adsorption of methyl violet MV on crosslinked alginate beads was found to be comparatively higher than that of WCaAB, DCaAB, and WEpAB. The extent of adsorption of methyl violet MV onto crosslinked alginate beads (DEpAB) was found to be a function of the pH of the solution, contact time, sorbate concentration, amount of beads and stirring speed. The kinetics adsorption of MV onto cross-linked alginate beads (DEpAB) was investigated using the pseudo-frst-order, pseudo-second-order, and intraparticle difusion kinetic models. The results showed that the pseudo-second-order kinetic model adequately describes the experimental data. Keywords Biopolymer · Sodium alginate · Cross-linking · Epichlorohydrin · Alginate beads · Adsorption · Methyl violet * Hakim Lounici
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